The Bandwidth and Cloud Services Group Company Profile

REVOLUTIONIZING CONNECTIVITY: UNLEASHING CREATIVITY AND INNOVATION TO BRIDGE THE DIGITAL DIVIDE IN UNDERSERVED AREAS OF AFRICA

ENABLINGA CONNECTED AFRICA

THINK BELIEVE CONNECT

BCS BANDWIDTH & CLOUD SERVICES GROUP

Profile

Name: Winston Nyabera

Position: Managing Director - Uganda, BCS Group

Bio:
Winston Nyabera is a visionary leader and expert in the field of connectivity, currently serving as the Managing Director for BCS Uganda and Rwanda. With a wealth of experience in the telecommunications industry, Winston has played a pivotal role in revolutionizing connectivity solutions across Africa. Throughout his career, Winston has demonstrated exceptional leadership skills and a deep understanding of project development, construction, fiber management and commercialization of fiber networks (Backbone, Metro and Access). His expertise in strategy, commercial, finance, fundraising, management, technical and operations of fiber networks has made him a sought-after professional in the industry.

Education:
Winston holds a Bachelor of Science degree in Electronics and Computer Engineering from JKUAT. He has also received specialized training in South Africa, earning a Mini MBA in Telecoms.

Achievements:
Under Winston's guidance, BCS Group has achieved remarkable milestones and established itself as a leader in the connectivity landscape. As the Group Chief Projects Officer, Winston successfully managed and implemented numerous projects, including submarine and railway connectivity deployments. These groundbreaking solutions have bridged the digital divide and brought connectivity to underserved areas.

One of Winston's notable achievements was spearheading the Co-build program, a pioneering initiative that transformed fiber rollout across the continent. This collaborative effort revolutionized connectivity infrastructure, enabling faster and more reliable internet access for communities throughout Africa.

Winston's leadership extends to navigating complex terrains, as demonstrated by his successful ventures in the Democratic Republic of Congo. By leveraging innovative strategies and partnerships, he has overcome challenging circumstances and turned them into unprecedented successes.

Currently, Winston is overseeing Open Access initiatives in Uganda, where he is instrumental in deploying FTTX (Fiber-to-the-X) solutions. By championing Open Access, he has played a pivotal role in democratizing access to high-speed internet, empowering individuals and communities across the nation.

Who We Are

BCS group is a Pan-African telecom infrastructure company that operates across the African continent and specializes in delivering fiber connectivity solutions to wholesale customers. Our network coverage spans over 80,000km+ of backbone and metro fiber, encompassing 17 countries in eastern, central, and southern Africa, which allows us to reach an estimated 80million+ end users. We offer a range of services, including fiber construction, carrier grade IP transit, global and regional connectivity, colocation services, and open access FTTX on EPC, co-build, own build and managed capacity models.

BCS group owns one of the largest terrestrial fiber networks in Africa.

BCS group operates under licenses in eight African countries including Angola, democratic republic of Congo, Kenya, Malawi, Rwanda, Uganda, Zambia and Zimbabwe. Additionally, we provide services at the border points for other countries such as Botswana, Burundi, Ethiopia, Mozambique, Namibia, Republic of Congo, South Africa, South Sudan and Tanzania.

80,000KM Network Coverage

17 African Countries Served

150K+ Buildings & Homes Connected

80M+ People Connected

2,500+ Towers Connected

Our Footprint Map

Our Services

- Carrier Grade IP Transit
- Fiber Construction
- Colocation Services
- Network Transmission
- Open Access FTTx
- Global & Regional Connectivity

OUR PARTNERSHIP MODELS

1. CO-BUILD WITH BCS

- BCS and the client mutually fund CAPEX for fiber construction.
- Each party owns a percentage of the fiber cores and share, in proportion, the cost of fiber maintenance.
- The client owns fiber infrastructure at a fraction of the CAPEX that would be required to build their full fiber infrastructure.

2. LEASE OR PURCHASE BCS BUILT FIBER

- BCS fully funds fiber construction following a plan based on the client's need.
- Once complete, client pays lease or IRU fee to BCS for Dark Fiber/Lit Capacity.
- The client has access to fiber infrastructure, at competitive rates and best-in-class SLA, with minimum investment.

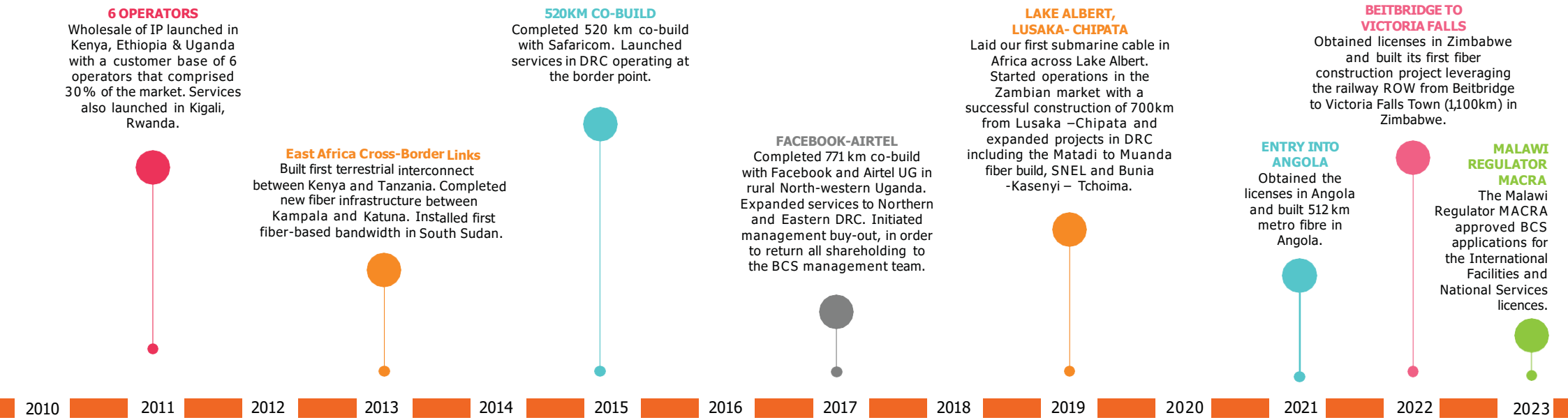
3. BCS AS EPC CONTRACTOR

- BCS is the EPC contractor, offering highly competitive rates.
- The client owns the fiber and is responsible for all maintenance, may contract BCS for maintenance.
- The client gains competitive advantage by procuring construction services at competitive cost and sole ownership over fiber.

4. DARK FIBER MANAGED SERVICES

- BCS provides Dark Fiber Managed Services in jurisdictions where the client is not licensed.
- With this service, the client obtains ownership rights on the fiber and full benefits of dark fiber utilizing BCS licenses.
- If the client later acquires a license, they have conversion rights to full ownership of the dark fiber.

Our Journey



2010 LAUNCH
BCS Group founded by Yonas Maru who had a dream of making a change in his homeland, Africa.

6 OPERATORS
Wholesale of IP launched in Kenya, Ethiopia & Uganda with a customer base of 6 operators that comprised 30% of the market. Services also launched in Kigali, Rwanda.

DJIBOUTI
Provisioning of terrestrial bandwidth capacity in East Africa via Djibouti.

East Africa Cross-Border Links
Built first terrestrial interconnect between Kenya and Tanzania. Completed new fiber infrastructure between Kampala and Katuna. Installed first fiber-based bandwidth in South Sudan.

3 BORDER POINTS
Developed terrestrial infrastructure in Rwanda, connecting to 3 borders Tanzania, Burundi and Uganda. Completed 1,300 km co- build with Airtel Uganda.

520KM CO-BUILD
Completed 520 km co-build with Safaricom. Launched services in DRC operating at the border point.

400KM FIBER
Built 400 km of fiber in Uganda, making Rwanda fully redundant. Launched services in Burundi.

FACEBOOK-AIRTEL
Completed 771 km co-build with Facebook and Airtel UG in rural North-western Uganda. Expanded services to Northern and Eastern DRC. Initiated management buy-out, in order to return all shareholding to the BCS management team.

SOUTHERN AFRICA
Obtained licenses in Zambia marking BCS's entry into Southern Africa. Completed management buy-out and secured $18M debt facility from the European Investment Bank.

LAKE ALBERT, LUSAKA- CHIPATA
Laid our first submarine cable in Africa across Lake Albert. Started operations in the Zambian market with a successful construction of 700km from Lusaka –Chipata and expanded projects in DRC including the Matadi to Muanda fiber build, SNEL and Bunia -Kasenyi – Tchoima.

Entry to DRC
Built 700 km of metro in Uganda. Installed the 2nd submarine cable in Lake Albert and obtained license in DRC. Built 700 km of metropolitan in Uganda.

ENTRY INTO ANGOLA
Obtained the licenses in Angola and built 512 km metro fibre in Angola.

BEITBRIDGE TO VICTORIA FALLS
Obtained licenses in Zimbabwe and built its first fiber construction project leveraging the railway ROW from Beitbridge to Victoria Falls Town (1,100km) in Zimbabwe.

MALAWI REGULATOR MACRA
The Malawi Regulator MACRA approved BCS applications for the International Facilities and National Services licences.

LAKE TANGANYIKA
BCS Group deploying a submarine link on Lake Tanganyika to connect the Eastern DRC towns of Bukavu, Uvira, Baraka & Kalemie, to serve as an alternate gateway in Eastern and Southern Africa.

Overcoming Connectivity Challenges: Connecting Underserved Areas in Africa

Navigating connectivity in underserved areas of rural Africa poses several challenges, particularly in regions where proper road infrastructure is lacking or poorly maintained. These challenges can significantly impact the deployment and maintenance of digital infrastructure. Some specific challenges include:

- **Inadequate Road Infrastructure:** Eastern, Central, and Southern Africa often face issues with poor road infrastructure in rural areas, making it difficult to access underserved communities. The lack of proper roads hinders the transportation of materials and equipment required for deploying and maintaining digital infrastructure.

- **Maintenance Issues:** The challenges with maintaining road infrastructure in these areas can further affect the maintenance of digital infrastructure. Damaged or poorly maintained roads make it challenging to carry out regular maintenance activities on the digital infrastructure network.

- **Rehabilitation and Relocation:** Rehabilitation or relocation of road infrastructure, water and sewerage utilities, and property development projects can inadvertently lead to damage to the digital infrastructure. These activities may involve excavation or construction work that can disrupt or cause harm to the existing digital infrastructure.

- **Bushfires:** Rural areas in Africa are susceptible to bushfires, which can pose a significant threat to overhead infrastructure such as fiber optic cables. The risk of damage from bushfires necessitates strategic planning and protective measures to ensure the resilience of the digital infrastructure.

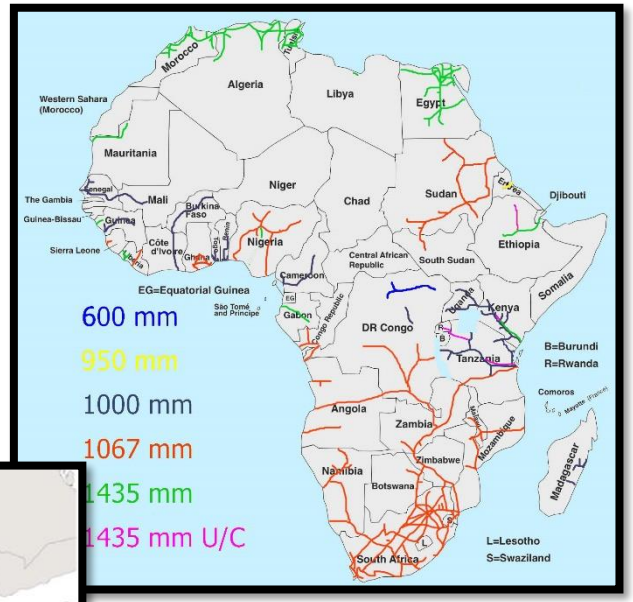
- **Lack of Awareness:** Communities in underserved areas may lack awareness of the importance of digital infrastructure. Without proper education and understanding, there is a risk of intentional damage or vandalism to the deployed infrastructure.

Innovative Solutions for Connectivity in Underserved Areas of Africa

To navigate connectivity in rural Africa, innovative approaches utilizing railroads and submarine deployments have shown promising results:

Railroad Connectivity: Railroads still play a crucial role in cargo and human transportation across East, Central, and Southern Africa. Leveraging the existing railroad infrastructure can provide an efficient pathway for deploying digital infrastructure.

Deployment along the Railroad Corridors: BCS Group has developed deployment methods along railroad corridors. These methods include both overhead and underground deployment approaches. Overhead infrastructure involves installing fiber optic cables on existing railway structures, such as poles or bridges. Underground deployment utilizes mechanized techniques like the Rail Ripper and Plough to bury fiber optic cables alongside the rail tracks.



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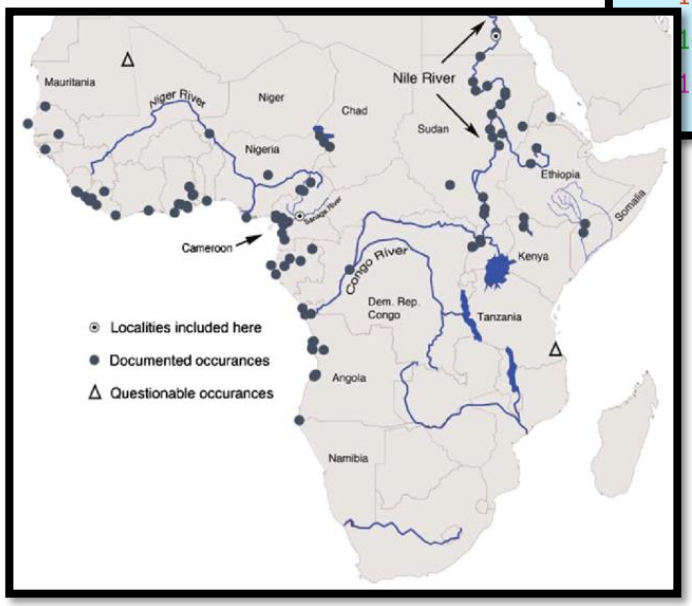
Submarine Connectivity: The region's numerous lakes and rivers offer potential routes for deploying digital infrastructure. These bodies of water are still used for transportation, and leveraging them for submarine deployments can bring connectivity to underserved areas.

Deployment along Lakes and Rivers: BCS Group has developed methodologies for deploying digital infrastructure along lakes and rivers in Sub Sahara Africa. By utilizing specialized equipment and techniques, such as submarine cable laying vessels, the group can effectively lay submarine cables beneath the water bodies.



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Railway Connectivity

Railway build

Plow machines

Ripper

Our Railway team

Splicing team

Submarine Connectivity

A fully prepared cable laying barge

Submarine cable being laid in water

A fully assembled marine joint being laid in the water

A submarine joint being spliced

Beach manhole construction

Submarine cable being pulled to the shore

Last Mile Connectivity in Schools: Open Access Model Solutions

The Open Access model in bridging the digital divide for underserved schools is a powerful solution that addresses various challenges hindering access to digital education.

The Open Access model in FTTx (Fiber to the X) refers to an approach where the physical fiber infrastructure is shared among multiple service providers, allowing them to offer their services over the same network.

In the Open Access model, the fiber network infrastructure is owned and maintained by a neutral entity, often referred to as a wholesale network operator or infrastructure provider. This entity is responsible for deploying and managing the physical fiber network, including the fiber cables, distribution points, and other necessary equipment.

Multiple service providers, such as internet service providers (ISPs), telecom operators, or content providers, can lease or access the fiber infrastructure from the wholesale network operator. These service providers can then offer their own broadband, voice, video, or other value-added services to end-users (residential or commercial) over the shared network.

The key characteristics of the Open Access model in FTTx include:

1. **Infrastructure Sharing:** The physical fiber infrastructure is shared among multiple service providers, avoiding the need for each provider to build and maintain its separate network.
2. **Non-Discriminatory Access:** The wholesale network operator treats all service providers equally, providing them with fair and non-discriminatory access to the infrastructure.
3. **Service Provider Competition:** End-users have the freedom to choose their preferred service provider from the available options, promoting competition among service providers based on pricing, service quality, and value-added offerings.
4. **Network Neutrality:** The Open Access model supports network neutrality principles, which means that the network operator treats all data transmitted over the network equally, without favoring or discriminating against specific services, applications, or content.
5. **Simplified Operations:** The wholesale network operator takes care of the physical network operations and maintenance, including troubleshooting, repairs, and capacity upgrades. Service providers can focus on delivering their services without the burden of managing the underlying infrastructure.

Last Mile Connectivity in Schools: Open Access Model Solutions

The Open Access model offers innovative approaches to tackle issues such as;

Challenges	Open Access Model Solutions
Lack of Power Connectivity	Shared power infrastructure reduces costs and ensures reliable power connections for schools.
Limited Internet Bandwidth	Sharing high-speed internet infrastructure among providers increases available bandwidth for schools.
Unreliable Internet Connectivity	Redundancy and backup solutions through shared infrastructure ensure reliable internet connections.
Maintenance and Support	Centralized maintenance and support of shared infrastructure minimize downtime and provide technical assistance.
Affordability and Pricing	Competition among service providers drives down prices, making digital education services more affordable.
Cost of Infrastructure	Sharing infrastructure reduces costs, making deployment of digital infrastructure more cost-effective.
Proximity to Tap Points	Extending and strategically placing tap points brings digital infrastructure closer to underserved schools.
Digital Literacy	Collaboration with schools and communities enables digital literacy programs and training for teachers and students.
Sustainable Funding and Partnerships	Collaboration among stakeholders secures sustainable funding and establishes partnerships for infrastructure expansion.
Digital Divide Awareness and Education	Engagement in awareness campaigns and educational initiatives helps bridge the digital divide and promote equal access to education.

Projects Gallery

BCS has been utilizing its expertise in the region since 2010 to build both overhead and underground fiber networks at a higher throughput and lower cost than our competitors. This has been made possible largely because of our highly mechanized operation.


Ground Ripping


Duct Installation


Fiber Splicing


Fiber Blowing


Manhole Installation


Duct Integrity Test


Railway Fiber Laying


Pole Planting

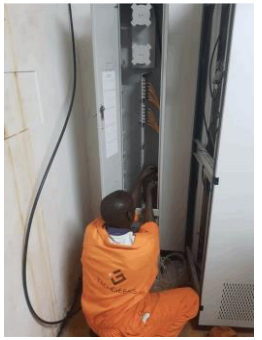

Overhead Fiber Stringing


Nile Crossing


Site Entry Installation


Outdoor ODF Installation

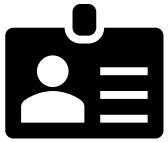

Indoor ODF Installation


Fiber Termination

The Pillars of Cybersecurity

Physical Security

•**Definition:** Protecting physical assets, such as servers and networking equipment, to prevent unauthorized access or tampering.
•**Key Measures:** Access controls, surveillance, and secure facility design contribute to physical security

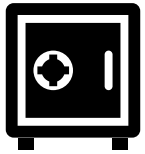


Authentication

•**Definition:** Verifying the identity of users, systems, and devices to ensure that only authorized entities access resources.
•**Key Measures:** Passwords, multi-factor authentication (MFA), and biometric authentication contribute to robust authentication mechanisms.

Confidentiality

•**Definition:** Ensuring that sensitive information is accessible only to those who are authorized to view it.
•**Key Measures:** Encryption, access controls, and data classification are employed to safeguard confidential data.



Integrity

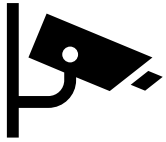
•**Definition:** Guaranteeing the accuracy and trustworthiness of data by preventing unauthorized alterations.
•**Key Measures:** Hash functions, digital signatures, and access controls help maintain data integrity.

Availability

•**Definition:** Ensuring that systems and data are available and accessible to authorized users when needed.
•**Key Measures:** Redundancy, backups, and disaster recovery plans are implemented to minimize downtime and ensure continuous availability.

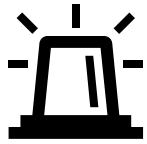
Authorization

•**Definition:** Granting appropriate permissions and access rights to authenticated users, limiting access to only what is necessary for their roles.
•**Key Measures:** Role-based access controls (RBAC) and access management policies are implemented to enforce proper authorization.



Audit and Monitoring

•**Definition:** Regularly tracking and monitoring activities to detect and respond to security incidents or policy violations.
•**Key Measures:** Security Information and Event Management (SIEM) systems, log analysis, and continuous monitoring contribute to effective audit and monitoring.



Incident Response

•**Definition:** Developing and implementing plans to respond quickly and effectively to cybersecurity incidents.
•**Key Measures:** Incident response plans, incident detection systems, and communication protocols are established to handle and recover from security incidents.

Security by Design

•**Definition:** Integrating security considerations into the design and development of systems and applications from the outset.
•**Key Measures:** Secure coding practices, threat modeling, and regular security assessments contribute to security by design.

Cybersecurity In Connectivity

- Cybersecurity refers to the set of practices, technologies, and measures implemented to safeguard digital networks, systems, and data from cyber threats and unauthorized access.
- The goal is to ensure the confidentiality, integrity, and availability of information and services within a connected environment. In the specific scenario of deploying digital infrastructure in underserved rural areas, the following aspects of cybersecurity are particularly relevant:

Items	Action point	Description
Regulatory Compliance	Ensure compliance with relevant cybersecurity regulations and standards, meeting specific security requirements set by regulatory authorities.	Follow the Rules: There are some rules set by the people in charge to keep the internet safe. We make sure to follow those rules to keep everyone protected.
Physical Security	Restrict physical access to fiber optic cables and related infrastructure to prevent tampering or damage. Surveillance systems can enhance physical security.	Lock the Doors: We have to make sure that the places where the internet cables and equipment are kept are locked up tight, like locking the doors to your house.
Network Security	Deploy firewalls and intrusion detection systems to monitor and control network traffic, safeguarding against cyber threats and unauthorized access.	Guard the Highway: Think of the internet highway as a road. We need security guards (firewalls and detectors) to watch over it and make sure no bad guys enter or do anything harmful.
Encryption Protocols	Implement robust encryption protocols to secure data transmitted over fiber optic cables, preventing unauthorized access or interception.	Keep Information Secret: Imagine the internet is like a highway, and your data is the cars driving on it. To keep your data safe, we use special codes to lock it up so that only the right people can see it.
Endpoint Security	Ensure that devices connected to the fiber network have updated antivirus and anti-malware software, reducing the risk of malicious software compromising the security of the network.	Protect Your Devices: Just like you have antivirus on your computer to keep it safe, we need to make sure all the devices connected to the internet are protected too.
Data Backups	Regularly back up critical data to facilitate quick recovery in case of a cyber incident, minimizing the impact of potential data loss.	Backup Important Stuff: Like how you make copies of your favorite photos, we also need to make copies of important internet data, so if something goes wrong, we can get it back.
Regular Software Updates	Keep all hardware and software components, including routers and switches, up to date with the latest security patches to mitigate vulnerabilities.	Keep Things Up to Date: You know how your phone needs updates? Well, all the internet equipment needs updates too, so they stay strong against cyber-attacks.
Incident Response and Disaster Recovery Plans	Develop and implement robust incident response plans to address cybersecurity incidents promptly. Having disaster recovery plans ensures the rapid restoration of services.	Have a Plan for Emergencies: When bad things happen, like a cyber-attack, we need a plan to fix things fast, just like how firefighters have a plan for putting out fires.
User Education	Conduct training programs to educate users and stakeholders about cybersecurity best practices, emphasizing the importance of recognizing and reporting potential security threats	Learn How to Stay Safe: We teach people how to recognize and avoid cyber threats, like not opening emails from strangers or sharing important passwords.
Collaboration and Information Sharing	Foster collaboration among stakeholders to share information about emerging threats and vulnerabilities, strengthening the collective defense against cyber threats.	Work Together: We all work together like a team. If someone sees a problem, they tell others so that we can all stay safe on the internet highway.

Thank You

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